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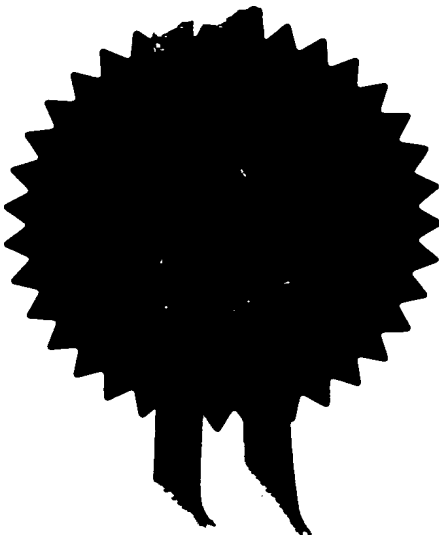
I, the undersigned, being an officer duly authorised in accordance with Section 74(1) and (4) of the Deregulation & Contracting Out Act 1994, to sign and issue certificates on behalf of the Comptroller-General, hereby certify that annexed hereto is a true copy of the documents as originally filed in connection with the patent application identified therein.

I also certify that the attached copy of the request for grant of a Patent (Form 1/77) bears an amendment, effected by this office, following a request by the applicant and agreed to by the Comptroller-General.

In accordance with the Patents (Companies Re-registration) Rules 1982, if a company named in this certificate and any accompanying documents has re-registered under the Companies Act 1980 with the same name as that with which it was registered immediately before re-registration save for the substitution as, or inclusion as, the last part of the name of the words "public limited company" or their equivalents in Welsh, references to the name of the company in this certificate and any accompanying documents shall be treated as references to the name with which it is so re-registered.

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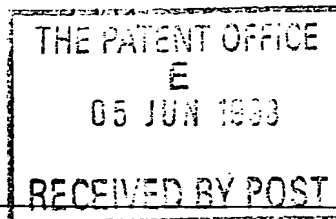
Signed *AmBrewster*

Dated 5 July 2000



**Request for grant of a patent**

(See the notes on the back of this form. You can also get an explanatory leaflet from the Patent Office to help you fill in this form)



07JUN99 E452177-1 C52479  
P01/7700 0.00 - 9913000.7

The Patent Office

Cardiff Road  
Newport  
Gwent NP9 1RH

1. Your reference

2. Patent application number  
(The Patent Office will fill in this part)

**9913000.7**

**5 JUN 1999**

3. Full name, address and postcode of the or of each applicant (underline all surnames)

MR JOHN TIMMINS 5546163001  
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WOLVERHAMPTON WV11 2DW

Patents ADP number (if you know it)

MR JOHN A TIMMINS 767365000  
15 HOLLYBANK AVENUE  
ESSINGTON, WOLVERHAMPTON WV11 2BZ

If the applicant is a corporate body, give the country/state of its incorporation

4. Title of the invention

**AN IMPROVED OIL/WATER SEPARATING DEVICE.**

5. Name of your agent (if you have one)

"Address for service" in the United Kingdom to which all correspondence should be sent (including the postcode)

FORSTER KELLEY & CO  
Chamberlain House  
Paradise Place  
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B3 3HP.

~~140 HIGH HILL~~  
~~ESSINGTON~~  
~~WOLVERHAMPTON WV11 2DW.~~

Patents ADP number (if you know it)

6. If you are declaring priority from one or more earlier patent applications, give the country and the date of filing of the or of each of these earlier applications and (if you know it) the or each application number

Country

Priority application number  
(if you know it)

Date of filing  
(day / month / year)

7. If this application is divided or otherwise derived from an earlier UK application, give the number and the filing date of the earlier application

Number of earlier application

Date of filing  
(day / month / year)

8. Is a statement of inventorship and of right to grant of a patent required in support of this request? (Answer 'Yes' if:

- a) any applicant named in part 3 is not an inventor, or
  - b) there is an inventor who is not named as an applicant, or
  - c) any named applicant is a corporate body.
- See note (d))

**NO**

9. Enter the number of sheets of any of the following items you are filing with this form. Do not count copies of the same document

Continuation sheets of this form

Description

Claim(s)

Abstract

Drawing(s)

NIL (0)  
TWO (2)  
TWO (2)  
ONE (1)  
FOUR (4)

10. If you are also filing any of the following, state how many against each item.

Priority documents

Translations of priority documents

Statement of inventorship and right to grant of a patent (Patents Form 7/77)

Request for preliminary examination and search (Patents Form 9/77)

Request for substantive examination (Patents Form 10/77)

Any other documents (please specify)

11. I/We request the grant of a patent on the basis of this application.

Signature

*John Timmins*

Date 4-6-99

12. Name and daytime telephone number of person to contact in the United Kingdom

JOHN TIMMINS 01922 402601

### Warning

After an application for a patent has been filed, the Comptroller of the Patent Office will consider whether publication or communication of the invention should be prohibited or restricted under Section 22 of the Patents Act 1977. You will be informed if it is necessary to prohibit or restrict your invention in this way. Furthermore, if you live in the United Kingdom, Section 23 of the Patents Act 1977 stops you from applying for a patent abroad without first getting written permission from the Patent Office unless an application has been filed at least 6 weeks beforehand in the United Kingdom for a patent for the same invention and either no direction prohibiting publication or communication has been given, or any such direction has been revoked.

### Notes

- If you need help to fill in this form or you have any questions, please contact the Patent Office on 0645 500505.
- Write your answers in capital letters using black ink or you may type them.
- If there is not enough space for all the relevant details on any part of this form, please continue on a separate sheet of paper and write "see continuation sheet" in the relevant part(s). Any continuation sheet should be attached to this form.
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- Once you have filled in the form you must remember to sign and date it.
- For details of the fee and ways to pay please contact the Patent Office.

Sheet 1  
AN IMPROVED OIL/WATER SEPARATING DEVICE

This invention relates to an improved oil/water separating device.

Please note that in this document:

Solution means any mixture or emulsion or solution formed by oil and water in any proportions, whether containing other ingredients or not.

Vessel means any container of whatever shape or size or number, holding a quantity of solution.

Oleophilic bag means any bag or net or porous or perforated container of any description made of or from or holding a quantity of oleophilic and hydrophobic or similar substance of any kind. This material is commercially and easily available in the form of a melt blown polymer.

Carbon bag means any bag or net or porous or perforated container of any description made of or from or holding a quantity of activated carbon or similar or substance of any description used or suitable for the purpose of removing contaminants from water.

Solutions are common in industry, for example, condensate from many compressed air systems consists mainly of a mixture of water from the air and oil from the compressing process, with some of the oil emulsifying with the water.

To comply with legislation, most of the oil must be removed before the remaining water with, typically, a maximum oil content of 20ppm., can be disposed of into drains or even onto the ground.

Existing oil/water separators consist of a settling tank with a weir device arranged to 'float off' any oil which settles on the surface of the solution, with the cleaner solution from the bottom of the tank then passing through activated carbon for final cleaning but some oils or some circumstances cause a thick semi-liquid substance commonly known as 'mayonnaise' to form. This 'mayonnaise' floats in the solution with most of its bulk beneath the surface, ice berg like, which means that it will not pass over a weir. As the amount of mayonnaise in the settling tank increases and as the mayonnaise cannot escape from the settling tank, the settling tank fills with mayonnaise until the mayonnaise reaches the bottom of the settling tank and is then passed through the outlet pipe, blocking the activated carbon and causing problems and increased costs. In an attempt to overcome this problem, manufacturers of existing machines supply a small bag containing oleophilic material which sits on top of the bag containing the activated carbon in order to remove any un-emulsified oil or mayonnaise before it can block the activated carbon. This system is not satisfactory, however, as the amount of oleophilic material supplied is small and is quickly overloaded as the accumulated oil tries to pass through the system..

According to the present invention and referring to drawing 'A', an amount of solution 1 is collected in a chamber 2. The chamber 2 may be open at or near to its top to allow solution to enter and displaced air to escape but otherwise is watertight except for an open pipe connection 8 connecting the bottom of chamber 2 to the bottom of chamber 7. The level of solution 1 in chamber 2 and also, therefore, in

## Sheet 2

chamber 7 via connecting pipe 8, is maintained by drain-pipe 6 being permanently open, the height of drain-pipe 6 and the height of chamber 2 above the base of the machine being sufficient to maintain the depth of solution 1 in chamber 2 so as to allow an oleophilic bag 4 to freely and fully float on or to freely and fully sink into the solution 1. Any free or un-emulsified oil contained in the solution 1, being less dense than the solution 1, will tend to collect at the surface of solution 1 so that the concentration of oil will be greater towards the surface of solution 1 where the oil will come into contact with and will be absorbed by the oleophilic bag 4. As more solution is introduced to chamber 2, an equal amount of the solution, now free of any un-emulsified oil, from the bottom of chamber 2 will pass through pipe 8 and pass upwards through carbon bag 5 for final cleansing before leaving the machine through drain-pipe 6. As oleophilic bag 4 attracts more and more oil, it will become heavier and heavier and will float lower and lower in the solution 1 in chamber 2 until the oleophilic bag 4 is saturated with oil, when it will be nearly fully submerged in the solution 1 as shown in drawing 'B'. The oleophilic bag 4 then needs to be renewed.

For a smaller system or a system containing less oil, both the oleophilic bag 4 and the carbon bag 5 could be arranged in a common vessel 2 by placing the carbon bag 5 at the bottom of the vessel 2 with the oleophilic bag 4 above carbon bag 5, as shown in drawing 'C'. If the vessel 2 is now allowed to fill with the solution to a sufficient depth to enable the oleophilic bag 4 to either fully float in solution 1 or to fully sink into solution 1, as described above, the oleophilic bag 4 will initially float on the surface of the solution 1 and absorb oil, as described above.

Drawing 'D' shows a possible arrangement for a larger or perhaps a more polluted system when it may be necessary to hold a larger quantity of solution 1 to enable a longer settling time. It will be possible to arrange either one or a number of vessels 2 & 7 with oleophilic bags or vessels with carbon bags or both types of bags in a common settling type tank 10. In this case, in order for the oil collecting at the surface of the solution to reach the oleophilic bag or bags 4, holes or slots or similar 9 are provided in the sides of the vessel or vessels 2 holding the oleophilic bag or bags 4, as shown. The vessel or vessels 7 holding the carbon bag or carbon bags 5 are not connected to the settling tank but are connected by connecting pipe 8, as described earlier, to the bottom of the vessel or vessels 2 holding the oleophilic bag or bags 4. The holes or slots or similar 9 in the sides of the vessel or vessels 2 will not act as weirs as the level of solution in the vessel or vessels 2 and 7 will be maintained at the same height as the solution in the settlement tank 10, with the holes or slots or similar 9 continuing both above and below the surface of the solution 1, allowing any floating material such as 'mayonnaise' or thick un-emulsified oil, to easily pass into the vessel or vessels 2 holding the oleophilic bag or bags 4.

CLAIMS.

Claim 1) An oil/water separating device consisting of a container or containers holding some quantity of an oil/water solution to be cleaned and with a level control device to maintain the depth of solution such that an oleophilic bag is able to fully or partially float or to fully or to partially sink according to its weight compared with the density of the solution to be cleaned, will initially float on the top of or nearly on the top of the solution where the oleophilic bag will tend to absorb any available oil. As more and more oil is absorbed by the oleophilic and hydrophobic material in contact with the oil, the oleophilic bag will become heavier and will sink further into the solution, causing fresh, unused oleophilic and hydrophobic material to approach the surface of the solution, whilst the used and partially or fully saturated oleophilic and hydrophobic material which was at the surface of the solution is progressively forced further beneath the surface of the solution. The oleophilic and hydrophobic material will therefore be progressively used in layers and this process will continue until all the available oleophilic and hydrophobic material is saturated with oil or until all or most of the available oil is absorbed, whichever is first.

Claim 2) An oil/water separating device using a floating bag with oleophilic and hydrophobic material as claimed in claim 1), the oleophilic and hydrophobic material floating in the solution will contain and retain more oil than a similar bag surrounded by air as the oil contained by the oleophilic and hydrophobic material, being fully supported by the more dense solution, will effectively not have weight and will therefore not be pulled out of the oleophilic and hydrophobic material by gravity. When the fully saturated oleophilic and hydrophobic material is removed from the solution, of course, the oil will again have weight and will be subject to the force of gravity but this will not affect the oil removing process as long as the oleophilic and hydrophobic material is disposed of fairly quickly.

Claim 3) An oil/water separating device using a floating bag with oleophilic and hydrophobic material as claimed in claim 1) and in claim 2) enables a simple direct estimation of the amount of oil absorbed by the oleophilic and hydrophobic material to be judged, according to the amount of bag remaining either above or below the surface of the solution compared to its initial position.

Claim 4) An oil/water separating device using a floating oleophilic bag as claimed in claim 1), in claim 2) and in claim 3) enables a direct judgement of the amount of oil absorbed by the oleophilic bag to be made by means of a rod or similar indicator 11, shown in drawings 'A', 'B', 'C' and 'D', with its bottom end resting on or connected to the top of the oleophilic bag in some way with its top or other end visible from outside the machine as shown in drawings 'A', 'B', 'C' and 'D' such that a movement of the bag downwards will cause the rod to move downwards and hence to indicate the position of the oleophilic bag in the container and hence the amount of extra weight due to the increased oil content of the oleophilic bag.

Claim 5) An oil/water separating device using a floating oleophilic bag as claimed in claim 1), in claim 2), in claim 3) and in claim 4) enables a direct judgement of the amount of oil absorbed by the oleophilic bag to be made by means

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of a string or other such device with one end fastened in some way to the oleophilic bag with the other end outside the machine such that a movement downwards of the bag filled with oleophilic and hydrophobic material will cause the string or other such device to move an indicator or similar visible sign of the position of the oleophilic bag in the container and hence the amount of extra weight and oil content of the oleophilic bag.

Claim 6) An oil/water separating device using a floating oleophilic bag as claimed in claim 1), in claim 2), in claim 3), in claim 4) and in claim 5) will indicate, should the carbon bag become blocked, causing the solution level in chamber 2) and hence the oleophilic bag and hence the indicating device as described in claim 3), claim 4) and claim 5) or other such or similar devices, to increase or rise, owing to the solution not being able to escape from the machine past the blocked carbon bag and with solution still being fed into chamber 2).

Claim 7) An improved oil/water separating device substantially as described herein with reference to drawings 'A', 'B', 'C' and 'D'.

ABSTRACT

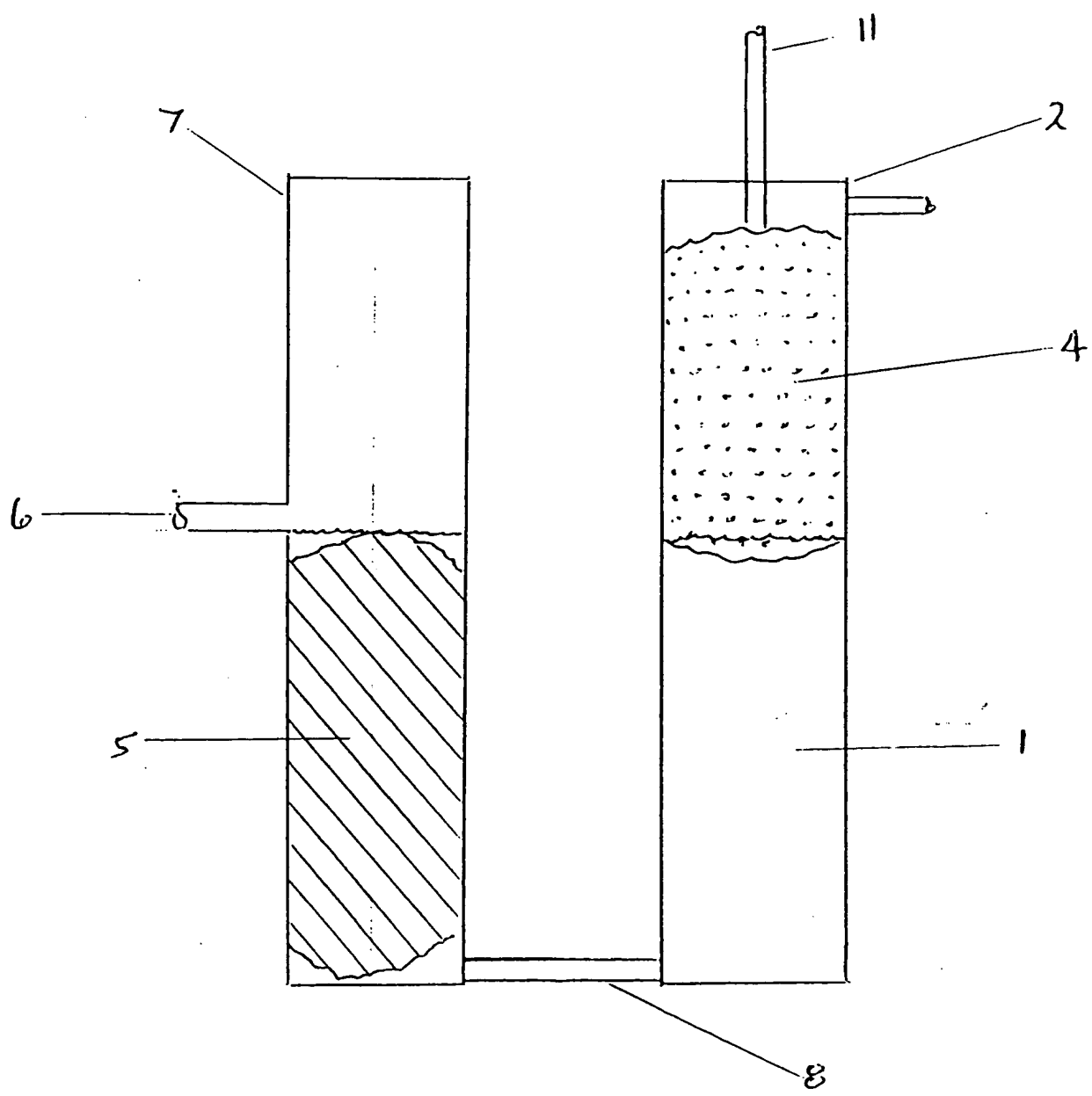
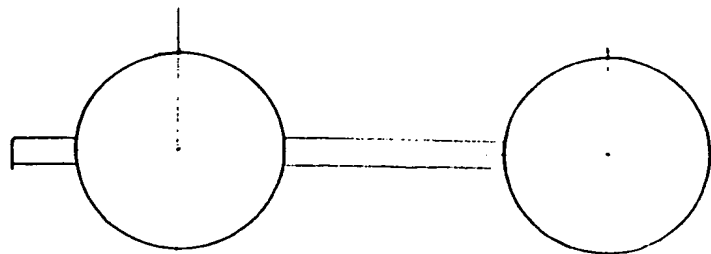
AN IMPROVED OIL/WATER SEPARATING DEVICE

An improved oil/water separating device using an oleophilic and hydrophobic or similar substance or material or similar floating on and in the solution to be treated so that the less dense oil tending to concentrate at or towards the top or surface of the solution will be absorbed by and into the oleophilic and hydrophobic material or similar oil attracting substance. The oleophilic and hydrophobic material or similar oil attracting substance will especially remove un-emulsified oil from solutions more efficiently than existing methods, will absorb more oil and will indicate, by its position in relation to the surface of the solution compared with its initial position when new and unused, the amount of oil contained by it and hence when its replacement becomes necessary.



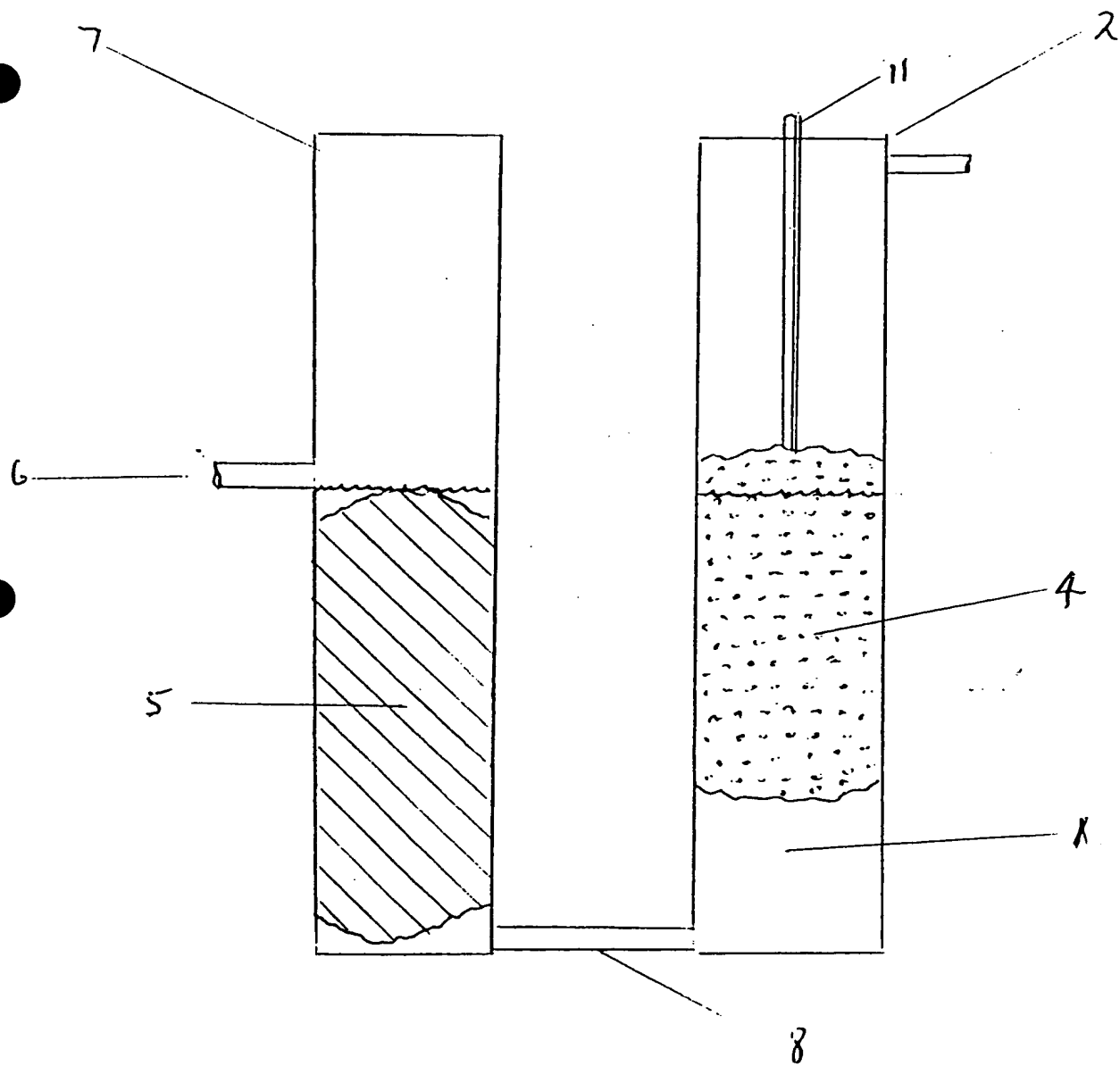
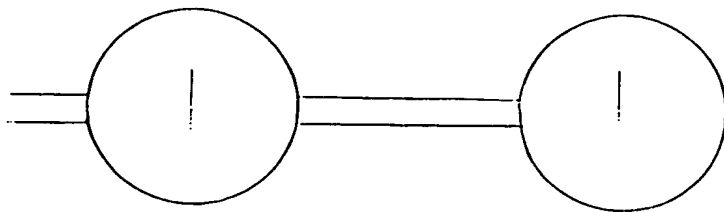
'A'

'A'

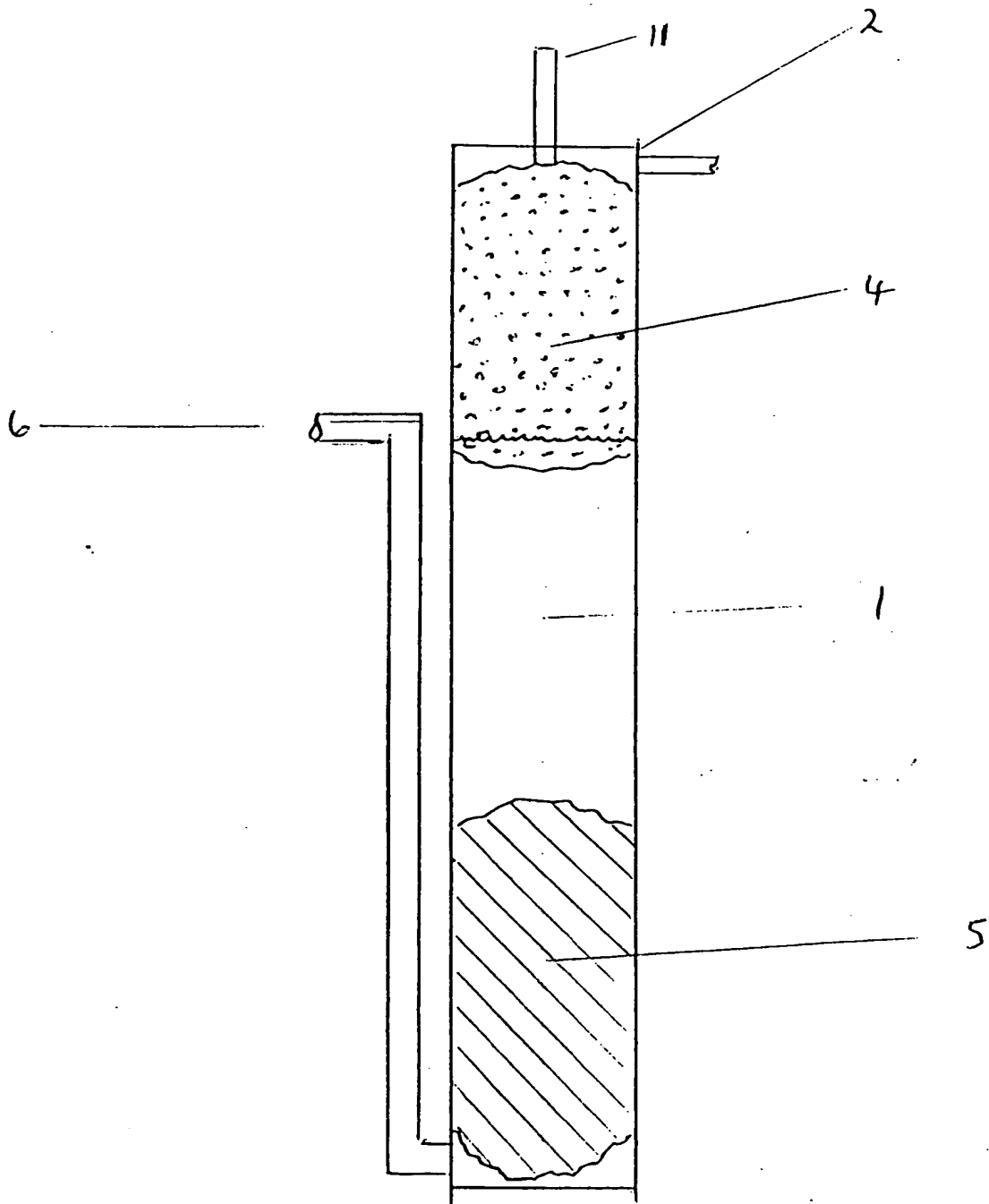
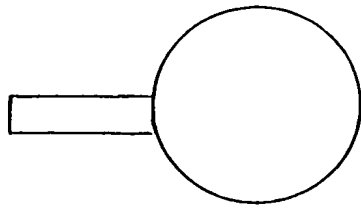




B









'D'

